Osteoarthritis of the Hand: Clinical Breakdown

Articular Cartilage Degradation, Subchondral Sclerosis, Joint Involvement Patterns (DIP, PIP, CMC), and Therapeutic Management

Osteoarthritis of the hand is a degenerative joint disease characterized by progressive breakdown of articular cartilage, subchondral bone remodeling, marginal osteophyte formation (bone spurs), and low-grade synovial inflammation. It predominantly affects the distal interphalangeal (DIP) joints, proximal interphalangeal (PIP) joints, and the first carpometacarpal (CMC) joint at the base of the thumb.

> **Core Clinical Principle:** Hand osteoarthritis manifests in distinct anatomical patterns. Involvement of the DIP joints leads to Heberden nodes, PIP joint involvement forms Bouchard nodes, and thumb CMC arthritis impairs critical pinch strength and hand dexterity.

1. Anatomical Joint Involvement & Clinical Features

Distinguishing affected hand joints helps characterize disease presentation and target functional rehabilitation.

Affected Hand Joint	Pathological Findings & Deformities	Functional Impact & Symptoms
DIP Joints (Distal)	Formation of bony enlargements known as **Heberden nodes**; cartilage loss and marginal osteophytes.	Stiffness, localized tenderness, mild angular deviation, and reduced fine motor dexterity.
PIP Joints (Proximal)	Formation of bony enlargements known as **Bouchard nodes**; joint space narrowing.	Swelling, aching discomfort, and reduced grip strength during forceful grasping.
Thumb CMC Joint (Base)	Degeneration of the carpometacarpal saddle joint, metacarpal subluxation, and key pinch instability.	Severe pain with pinching or gripping (e.g., turning keys, opening jars) and subluxation deformity.

2. Pathophysiology & Underlying Etiology

Understanding the cellular mechanisms of joint wear clarifies why cartilage breakdown progresses over time.

- **Cartilage Matrix Breakdown:** Imbalance between anabolic repair and catabolic degradation leads to enzymatic breakdown of type II collagen and aggrecan within the articular cartilage.
- **Subchondral Bone Remodeling:** As cartilage thins, underlying subchondral bone thickens (sclerosis) and forms marginal bony outgrowths (osteophytes) in response to altered mechanical loading.
- **Etiology & Risk Factors:** Strongly influenced by advanced age, female biological sex (particularly post-menopausal), genetic predisposition, and a history of repetitive mechanical joint trauma or heavy manual labor.

3. Clinical Presentation & Management Principles

Comprehensive management focuses on pain relief, functional preservation, and structural joint protection.

- **Clinical Presentation:** Joint pain worsened by activity and relieved by rest, morning stiffness lasting less than 30 minutes, bony swelling, loss of grip strength, and decreased range of motion.
- **Therapeutic Strategy:** Combines non-pharmacological care (occupational therapy, ergonomic splinting for the thumb CMC joint, thermal modalities) with pharmacologic options (topical NSAIDs, oral analgesics) and surgical interventions (arthrodesis or joint arthroplasty) for severe, refractory cases.